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Building Resilience along Developed Shorelines: Examining the Efficacy of Living Shorelines

There are a multitude of on-going efforts in North Carolina attempting to understand natural and human impacts on the coastal zone, the role of various management strategies, as well as prioritize habitat restoration projects. Living shorelines are one management strategy to address coastal erosion that has received a lot of attention. Traditional strategies employed to mitigate the impact of erosion have focused on shoreline protection, to the exclusion of coastal habitats. However, more recently living shorelines are being utilized to both mitigate erosion and provide habitat restoration; these encompass a range of vegetative and structural components and serve as an alternative approach to the use of hardened structures like bulkheads, which are known to aggravate erosion. The authors present a synthesis of some of the projects from North Carolina that address comprehensive mapping of estuarine shoreline erosion, habitats, and mitigation projects (living shoreline projects) and their outcomes.

Several projects have been undertaken to map the coast of North Carolina, the most comprehensive was the Estuarine Shoreline Mapping Project (ESMP) data created for the NC Division of Coastal Management in 2010. Since then, individual counties (or specific shoreline segments of interest) have been mapped over additional timesteps in order to understand regional trends in coastal erosion. Case study sites across North Carolina have been mapped over timesteps ranging from 1936 to 2017 using a combination of aerial imagery and in-situ RTK-GPS surveys. Results indicate that rates of shoreline erosion and driving factors vary considerably between sites across the state. However, several common issues have been highlighted, such as storm events and vessel traffic. At many of these sites living shorelines have been installed to mitigate erosion and expand wetland habitat. Living shoreline projects at the case study sites vary widely in design and in their development process. Of the 17 living shoreline project installations examined, 12 exhibited a reduction in the rate of erosion; of those 12, six were observed to be accreting. The average shoreline change rate among sites before installation was -0.45

$\pm 0.49 \text{ m yr}^{-1}$ and $-0.21 \pm 0.52 \text{ m yr}^{-1}$ (at sites in the northern coastal zone and the southern coastal zone of North Carolina, respectively). After installation, average SCR was significantly lower at northern and southern sites with living shorelines, $0.17 \pm 0.47 \text{ m yr}^{-1}$ and $-0.01 \pm 0.51 \text{ m yr}^{-1}$, respectively. The findings support the convention that living shorelines can reduce the rate of erosion and potentially restore lost shore zone habitat, making them a viable management strategy in North Carolina.